CAAM 210: INTRODUCTION TO COMPUTATIONAL ENGINEERING
FALL 2015

Instructor:	Franklin H. J. Kenter	**Lecture Time:**	MW 1p-2p
Email:	orange@rice.edu	**Lecture Location:**	Keck 100
		Lab Time:	Th 7p-8p or F 1p-2p
		Lab Location:	Individually Assigned
Office:	Duncan Hall 3018	**Office Hours:**	Th 10a-12p
Course Website:	see OWL-space		

Rice Learning Assistants:
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Summary

A high-paced, intense introduction to mathematical and scientific computing via MATLAB.

Concepts may include: variables, programming arithmetic, if-else statements, while and for loops, arrays and matrices, bisection method, Newton's method, fractal generation, solving combinatorial problems by brute force, basics of graph theory, PageRank, graph visualization with biograph, gaussian elimination, bridge-load modeling, multi-variable optimization via software, numerical simulations of the wave equation, introduction to image processing, machine learning and neural networks, and evolutionary game theory and the prisoner's dilemma.

Course Objectives and Learning Outcomes

- We strive for MATLAB fluency on various levels; To speak the language free of syntactic error, to confidently translate English simulation and/or design questions, to identify the proper numerical method for the job, and to represent the solution in the most visually striking way possible.
- Further, we desire for you to think about concrete real-world problems abstractly as to be able to instruct a computer (i.e., through MATLAB) how to compute a solution.
- Lastly, we hope to improve problem-solving capabilities by pushing them to the limit in this new abstract domain.

Required Texts and Materials

- Textbook: The notes for the course shall comprise the textbook for the course. The notes can be purchase from the Rice Bookstore. The notes are **NOT** available online.
- Software: MATLAB (Student Version acceptable) with *"Bioinformatics"* and *"Optimization"* toolboxes.

  Students are *expected to have continual, on-demand, access to a full-functional version of MATLAB.* I strongly recommend that students take advantage of the deep student discount and purchase a copy of MATLAB from Mathworks. **Tablet variations of MATLAB are not full-functional; do not buy them.** A version for your laptop/desktop costs $99 at the Mathworks Store. MATLAB also has a growing library of application and/or algorithm

specific toolboxes. We will make use of the *"Bioinformatics"* and *"Optimization"* toolboxes. The latter is one of the eight that comes free with the student version. Please be sure to purchase the Bioinformatics toolbox as an add-on. It costs $10-$29.

- Software: TopHat.

  TopHat is an interactive tool which students can interact during the large class sessions. While not required, it is highly recommended.

Exams, Papers, and Projects

Every week, students will produce a MATLAB project where students will be required translate English instructions into a MATLAB program that produces visual output. *Every assignment is pledged to some degree, it is the student's responsibility to understand what assistance is allowed.* If there are any questions, ask! There will be three "fully pledged" assignments where no assistance from others (though students may use any notes or references). For the other assignments, *students are allowed and encouraged to compose and troubleshoot with one another, but require he student to write, document, understand, festoon and submit his or her work.* By "document" I mean to write one's own English preamble (header) to write original English comments throughout the code. By "festoon", I mean to must label axes and title plots in an original and creative fashion. Further, in all cases, you are required to follow the guidelines set forth in the Honor Code section.

Assignment Procedure. The main header must conform to this standard:

```
First Name Last Name, CAAM 210, Fall 2015, Lab #
file name
program description
program usage instruction
program usage example
```

Students will publish each assignment to a single pdf file that you will subsequently upload to our OWL-space page. In addition, one should upload any and all .m files you used in his or her project.

The pdf will contain a copy of the code, a list of things written to the command window, and each of the figures the code generated.

Cumulativity of Select Assignments. Students should be forewarned that some of the assignments are cumulative in nature. That is, a few of the assignments build on top of the assignments from the previous one or two weeks. It will be the policy of this course NOT to give any solutions to previous lab projects. Therefore, if a student skips and fails to complete one such assignment, he or she may be expected to complete the previous assignment as part of the next. That being said, students should plan ahead if they anticipate busy schedules during this time.

Grade Policies

The grade will be determined on the basis of the total number of points earned. During the initial period of the course, the points per assignment will vary. However, thereafter, each student will be able to earn at least the following from each assignment:

- Quizzes, 50 points each
- Projects, 100 points each (that is, double the rubric)
- Thursday/Friday lab participation, 20 points per week

It should be noted that this, in fact, a minimum, and some assignments may allow students to earn even more points.

Grade	Points Required*
A+	2450
A	2275
A-	2100
B+	2000
⋮	⋮
C- (minimum passing grade)	1500
⋮	⋮
D-	1200
F	0

*The instructor reserves the right to lower the number of points required for each grade. However, in no case will it be raised.

Absence/Late Policies

Except for extreme circumstances, *no extensions or exemptions* will be granted on projects or lab attendance whatsoever. It is the student's responsibility to foresee any obstacles in completing the assignments and complete them ahead of time. If a student cannot attend the lab session on a regular basis, he or she should not take the course.

Rice Honor Code

In this course, all students will be held to the standards of the Rice Honor Code, a code that students pledged to honor when they matriculated at this institution. If a student is unfamiliar with the details of this code and how it is administered, he or she should consult the Honor System Handbook at `http://honor.rice.edu/honor-system-handbook/`. This handbook outlines the University's expectations for the integrity of academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

Projects. On most assignments students *are strongly encouraged to work in groups and collaborate with other students in the course.* However, students are expected **to write, document, understand, festoon and submit their own work.** "Document" means to write an original English preamble (header) and original comments throughout the code. "Festoon" means to label axes and title plots in an original and creative fashion. Further, in all cases, students should **only submit work they fully understand**. Students are free to consult any generic sources for help (i.e., class notes, MathWorks pages, video tutorial websites, etc); however, students are not allowed to consult any person not affiliated with the course (i.e., anyone other than students, TAs, RLAs, or the instructor), including external tutors, without express permission from the instructor.

Quizzes. Students may complete the quizzes with any aids or references they wish to use. However, students are expected to do so without help or collaboration with regard to the explicit questions on the quiz. The intention of the quizzes are to improve the understanding of a larger project, and as such, students are encouraged to discuss the general concepts and ideas on the quiz, **but not the explicit questions themselves.** Further, students are expected to not take unfair advantage of lapses in OWLSPACE (say when the answers may be accidentally available).

Overall. The fuzzy nature of these standards may make the Code hard to enforce, however, it remains the responsibility of each student to complete the assignments, *in good faith*, in a way consistent with the overall goals of the course set forth previously. In any case, egregious violations of the Code will be strictly enforced- most notability, **the submission of code clearly originating from previous semesters or previous students will absolutely not be tolerated**. It is the

responsibility of each student to fully understand the origin of the code they submit (which should only be themselves).

Disability Support Services

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / `adarice@rice.edu` / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Syllabus Change Policy

This syllabus is only a guide for the course and is subject to change with advanced notice.

Course Schedule

The planned schedule is below. For emphasis, the topics listed are planned to be covered that week and the corresponding project will be due at the start of the following week.

Week of August 24	Labs 0.0, 0.1, 0.2
Week of August 31	Labs 0.3, 0.4
Week of September 7	Lab 1. Bisection Method
Week of September 14	Lab 2. Newton's Method
Week of September 21	Lab 3. Complex Newton's Method
Week of September 28	Lab 4. Stochastic Chemical Networks
Week of October 5	Lab 5. Pledged Lab I
Week of October 12	Lab 6. Deterministic Chem. Networks
Week of October 19	Lab 7. Bridge I
Week of October 26	Lab 8. Bridge II
Week of November 2	Lab 9. Bridge III
Week of November 9	Lab 10. Gene Networks I
Week of November 16	Lab 11. Gene Networks II
Week of November 23	Lab 12. Pledged Lab II
Week of November 30	Lab 13. Pledged Lab III

Appendix of Changes

- Corrected room number.
- Clarified passing grade for Pass/Fail option.
- Completed assignment list.
- Added RLAs.